CUBA.

INCREASED STATE OF DISORDER.

SUPPRESSION OF A REPUBLICAN JOURNAL—THE NECESSITY OF AID FROM SPAIN—BOLDNESS OF THE INSURGENTS—CONCHA'S POLICY—FINANCIAL EMBARRASSMENTS.

[FROM A SPECIAL CORRESPONDENT OF THE TRIBUNE.]

HAVANA, April 17.—Nearly the last vestige of Republicanism has disappeared from this Island. On the 14th of April an official decree suspending the comic Republican journal *Juan Paloma* for one month appeared, and its editor was sent to Spain by the mail steamer of the following day. Everything is turning toward that form of monarchism of which Don Carlos is the representative. The telegraphic news from Spain for the past few days has been withheld by order of the Captain-General, who is thus beginning to exercise the unlimited powers with which he has been endowed by the Home Government. The grand parade and review of the volunteers took place last Sunday afternoon, the weather proving very propitious. A cool north wind was blowing at the time. The volunteers formed at noon, the line extending from the jail to a point beyond the Castillo del Principe, a distance of about three miles, and there were between 15,000 and 16,000 men under arms. At 4 o'clock Gen. Concha, accompanied by his staff and body-guard, rode along the line, stopping every now and then to exchange a few words with the different officers of the regiments, remarking to several that this body of men was a sufficient guarantee that the National integrity would be preserved. After inspecting the volunteers, he rode back and placed himself in front of the Tacon Theater, and the volunteers filed by in review. The enthusiasm among them, however, was not great; the only ones who cheered him were the colored firemen, and that was probably done at the suggestion of their officers. The volunteers looked well; some were well-armed with the Remington rifle, some few with the Winchester. Everything passed off quietly, excepting that a coachman received a bayonet wound from a volunteer for attempting to cross the line. A numerous concourse of spectators lined the streets.

It was reported that Concha did not intend to enforce the militia law, but it appears that he has changed his mind since the review. Whether it was owing to his surprise at seeing so many volunteers, or to the fact that hints had been given, that, if the Militia law were not enforced, the volunteers would be offended is uncertain. But the day after the parade an article appeared in the *Voz de Cuba* stating that preparations were going on for the immediate collection of the lists of persons liable to military duty. The slaves for the army are beginning to arrive at Havana, and, as they arrive, they are taken to the Palace. After inspection they are sent to their quarters. Notwithstanding the circumstance that they get their papers of freedom at the end of the campaign, they are far from being a contented looking set, and they do not seem to relish the idea of going out to fight. Now that Gen. Jovellar has gone, Concha's opinion in regard to aid from Spain seems to have changed, for his organ, the *Voz de Cuba*, denies that he ever said that he needed no men from Spain to crush the insurrection. Whether he needs them or not, it is not likely that Spain, in its present position, will have any men to spare for the Island of Cuba.

According to official reports from Puerto Principe on the morning of the 5th of April, at 9 o'clock, an insurgent force of 2,000 infantry and from 300 to 400 cavalry appeared before the encampment Caridad de Arteaga and began attacking the fort on various sides. At 2 o'clock most of them retired, leaving only a few scouts around the fort, who also disappeared at dusk. Five of the insurgents were seen to fall on the northern side and three on the southern side. This place is in the immediate vicinity of Puerto Principe. The volunteers in one of the numerous stockades in the environs of Puerto Principe being short of water, 28 of them offered or were ordered to bring in a supply from a lagoon in the vicinity; but they had hardly gone beyond rifle range, when they were attacked by the Cubans, and 25 out of the 28 were killed. The surviving three only succeeded in escaping through their swiftness of foot.

Cries from all quarters are daily reaching Havana from the Eastern and Central Departments of the island for more troops, and Concha is answering the call, as far as he is able. Eight hundred men will leave in a day or two for Nuevitas, and some of the mobilized colored firemen will also leave for the Trocha; but this small number will be of very little service. From the accounts of the Spaniards themselves, the insurgents have been seen in great force at six or eight different points at the same time. A letter published in the *Voz de Cuba* yesterday, from Gibara, represents the city and surrounding country to be in a state of great apprehension, both from attacks from the Cubans and from starvation, the Cubans having driven off all the cattle, and showing themselves boldly in the environs. There are no troops—or at least not enough—to send out against the enemy. Gen. Portillo, according to the *Voz de Cuba*, was to have struck a decisive blow after his arrival at Puerto Principe, but nothing has yet been heard of it. The Cubans are giving him every opportunity, and are even to be seen from the very house-tops of the town. It is reported that Portillo is not on the very best of terms with this Captain-General, and there is some talk of his being relieved; it is also rumored that Burnel, of Virginius notoriety, is to be appointed to the vacant position of Segundo Cabo, now filled ad interim by Riquelme, formerly chief of staff. Gen. Maximo Gomez is said to have challenged Gen. Portillo to fight, but the challenge has not been accepted. Portillo had not men enough, and what he had he could not rely upon. Gomez with a large force is near Caridad, about 1½ leagues from Puerto Principe. Brigadier Acosta is undergoing trial for disobedience of orders in not attacking the Cubans. His explanation he has sent to Gen. Concha. It is also reported that Concha will visit Puerto Principe on the 1st of the month, and perhaps take the field in person.

Gen. Concha visited the Casino on Monday evening. Two bands of music from the volunteer regiments playing the royal march were in attendance at the portals of the building, where Concha was received by the Board of Directors in a body. The building was illuminated within and without, and plants and statuary decorated the spacious saloons. A very fine orchestra was also in attendance and performed while Concha and the Board of Directors refreshed themselves from the ample board that was extended in the southern saloon. When the champagne began to flow Julian Zulueta, President of the institution, thanked the Captain-General for the honor which he conferred upon the Casino by his visit, and offered the loyal and enthusiastic coöperation of the institution, which at all times and under all circumstances showed its zeal in being ever at the side of the Spanish representative in Cuba. Zulueta also explained how much the Casino expected from the illustrious command of Concha as regards the pacification and prosperity of this province, which owed so much to Concha in the two previous epochs of his administration. The Captain-General, in answer, expressed his thanks for the attentions of which he was the object, saying that he knew, because the whole world knew, the significance and the value of the Spanish Casino of Havana as the center of loyal people, the stay of the authority and the firm support of the integrity of the nation. But the flattering and patriotic spectacle of which he was the witness was sufficient for him to comprehend the importance of the institution, which so truly represented the aspirations and true interests of Spanish Cuba.

Gen. Jovellar and family sailed on the 15th of April in the mail steamer for Spain. Several of the streets in Havana were decorated on the day of his departure, and he was escorted outside of the Morro by a great many people. All of the tug-boats in the harbor, as well as some of the ferry-boats (with bands of music on board), were hired for that purpose. Innumerable small boats and steam launches followed the steamer as far as the guard ship. The shore was lined with people as far as the Punta, opposite the Morro, and they waved a last farewell to the Captain-General whom all respected. It was a demonstration such as no other Captain-General had ever excited on his departure. The U. S. steamer Colorado arrived last Saturday and left again on Wednesday morning for Matanzas. Capt. Ransom, Pay-Inspector Williams, and Capt. Perry dined with the Captain-General on Tuesday evening, each one receiving a personal invitation. Consul General Hall was the only other guest, excepting a few of the General's staff. The Chinese envoy has paid a visit to Matanzas, and from there has gone on to Cardenas. He intends visiting most of the principal cities as well as plantations where Chinese are employed as laborers before his return to Havana. He is, however, very reticent, and his opinion about the treatment of the Chinamen he keeps to himself.

The complications in regard to the exchange offices are becoming more serious. A broker who has begun suit for damages against the newspapers and against a Government broker will, in all probability, be compelled to close his doors ere long. Two others are also thinking of closing for a fortnight, in order to show the public that they are not the cause of the rise in gold. It is rumored that several decrees will be issued by the Captain-General. One of them, it is said, will fix the price of gold at 50 per cent premium, and any one suspected of having taken part in any transaction above this figure will be tried by court-martial. It seems absurd to suppose that such an order can be enforced; but everybody is talking about it, and, as Captain-General Concha has absolute powers, one need be surprised at nothing. A forced loan of $30,000,000 is also talked of as well as the payment of all duties in gold. An English commercial house of this city some time ago bought about £40,000 sterling bills on England at 74 per cent premium from a Spanish house, one of the most prominent on the island, to be delivered the middle of April, either party having the option of paying the difference there might be in the rate of exchange or of delivering the bills of exchange. Exchange to-day being 163 per cent premium on England, a large sum of money has become due to the English house. Payment has been demanded but refused, and the Spaniard threatened that if the English house attempted to sue for the claim he would denounce the Englishmen to the Captain-General as monopolists and speculators aiding in the financial ruin of the island. The Spaniard, finding that the Englishmen were not to be frightened, agreed to pay about $90,000 as a compromise. In another affair (where one of the chief magnates of the island is affected), involving some $200,000 for rent of certain lands, the claimant wants gold and the courts have so decided. But Spanish bank bills have been tendered and refused. All the satisfaction that could be obtained was that, as soon as Concha came, the financial question would be settled. The person owing this sum of money has already taken the crop off of the land, but has not sold it here for paper money, but sent it to England, where no doubt he has many other thousands invested.

DRIFT OF POLITICAL DISCUSSION.

THE GERMAN VOTE IN THE WEST.

From The Chicago Staats-Zeitung (Rep.)

When the English papers in the East impudently assert that the whole West is in favor of the paper-money epidemic, it can be explained by the ordinary ignorance of "cultivated" Americans, but this excuse does not stand good for the German papers at the East. They could and must know that it is otherwise. In a number of the most important and prominent Western cities, the Germans have denied this by their votes. The Germans, so far as can be seen, are just as unanimously against the paper-money epidemic as against the prayer-epidemic. Even the workingman Karl Klings is as sensible on this question as Carl Schurz. This unanimity, naturally, has no retroactive effect on the members of the present Congress, chosen prior to the panic of September, 1873; on the contrary, these, in their foolish idea that they have behind them the "Republican party," have hobbled along in the footsteps of the great scoundrel from the East, Butler. But very soon they will find, to their loss, that the "Republican party" in the West is not in the majority with the German vote, and that not five out of 100 former German Republicans are willing to go with a party which has perpetrated an act branded by itself as a "national crime." What Mr. A. C. Hesing, under whose lead the Republican party in Chicago has won so many victories, recently said to the Republican Central Committee of Illinois possesses a significance extending far beyond the limits of our city and our State. It signifies that the Presidential election of 1872 was the last in which the votes of German citizens will be given to the Republican party in sufficient numbers to enable it to succeed in the West. For Mr. Hesing said not merely what he thinks, or what the *Illinois Staats-Zeitung* thinks, but what 95 out of 100 of those Germans who, in 1872, voted for Grant and Farwell think.

THE FATE OF CIVIL SERVICE REFORM.

From The New-Haven Palladium (Rep.)

Messrs. Dorman B. Eaton and Shellabarger, who have had the best opportunities for examining the workings of the system, refuse to admit that Civil Service reform has failed. On the contrary, they are encouraged by the success already achieved. The fate of the reform rests with Congress, where, it is to be feared, strong opposition will be made to granting the modest appropriation demanded by the Commissioners. Gen. Butler is frankly hostile to the reform. There are a good many Congressmen who are equally hostile to it, though less outspoken than he is. If sustained for a few years longer, it will, we believe, commend itself to the people, and it will then be difficult to overthrow it. For the present it is in the experimental stage, and, in spite of the sneers of the dissatisfied, the President is its best friend. Were he less earnest in the matter he would long since have become discouraged, and have abandoned it in disgust.

VITALITY OF THE REPUBLICAN PARTY.

From The Bangor Whig and Courier (Rep.)

The present is as full of glorious opportunities for the Republican party as any period of its history, if its leaders only read aright the signs of the times, and shape their course in obedience to the demands of the people. It is still the safeguard and reliance of the intelligent masses of the nation, and by making their cause its own it will render itself invincible in the future as in the past. There is no desire to break away from the glorious associations of its past career, or to abandon the colors under which such glorious victories have been won. It only needs that the best men shall come to the front, and that they shall lead in the direction commanded by the popular will, to insure a continuation of the triumphs which have marked the progress of the Republican party from the election of Abraham Lincoln to the ratification of the spirit of the Declaration of Independence in the Constitution of the United States.

THE ELECTORAL VOTE OF ARKANSAS.

From The Hartford Times (Dem.)

The admission is made that Brooks was elected Governor of Arkansas in 1872. If it is true (and nobody doubts the truth of the confession), it follows that the electoral vote of Arkansas should have been cast for Horace Greeley; for the same party and the same votes that elected Brooks were cast for the Greeley electors, Brooks then being a Greeley man. Baxter's pretended majority was 3,266, and Grant's pretended majority was 3,146. We stated at the time that it was a fraud. But so were the announced results in North Carolina and in Pennsylvania, and in some other States. Gen. Grant was never honestly and fairly reëlected to the Presidency. We did not believe he was at the time; and we are now getting a few of the evidences.

THE CONNECTICUT SENATORSHIP.

From The New-York Evening Post (Rep.)

The Senatorship continues to be the most interesting topic of political discussion in Connecticut. Mr. Eaton is the favorite candidate, but Mr. R. D. Hubbard and Mr. Barnum are also named. It is evident that Mr. Barnum's money has been too prominent an element in politics, and that his name is not received with much favor among the better class of Democrats. The true thing for Connecticut to do is to honor itself and benefit the country by putting Mr. David A. Wells into the Senate.

THE LOSS OF THE EUROPE.

EXPERIENCE OF THE SALVAGE CREW—A VESSEL SIGNALED WITHOUT SUCCESS—RESCUE OF THE CREW BY THE EGYPT.

In its issue of Wednesday morning *The Boston Globe* publishes a letter from Mr. Frank Alden Hill, dated at Liverpool, giving an account of the experience of the salvage crew of the steamship Europe, recently abandoned in mid-ocean. Mr. Hill was a passenger on the steamer Egypt, which fell in with the abandoned vessel and rescued the crew. He says that it was some time after the Greece left the Europe before the hose connections and apparatus for working the pumps of the latter could be found. When found they proved of little use. Although the crew worked hard the depth of water in the engine-room steadily increased, and at 8 p. m. it was found that the ship had commenced to make water, fore and aft. At 12½ a. m. on Saturday, April 4, the men on the Europe sighted a brig-rigged steamship, close by, and signaled her with blue lights and rockets, but to no purpose, as she continued on her course. By 12 m., Saturday, the water in the engine-room measured some 13 feet, with every prospect of increasing rapidly and driving the crew to the small boats, of which they had two. At 1½ p. m. the steamship Egypt hove in sight. Capt. Grogan of the Egypt, at the request of Chief Officer Buck, commanding the salvage crew, passed two hawsers on board the Europe. After towing her a short time, a hawser parted, and, as there was every indication of bad weather, Capt. Grogan decided to abandon the vessel. Mr. Hill says that, while the passengers and crew felt sad to leave so valuable and, apparently, so uninjured a ship to her fate, they could but commend the action of the captain in not endangering the safety of his own trusty ship, as well as the lives of all on board. When the Egypt left the Europe at 7 p. m., it was the impression of Capt. Grogan and all on board that she would sink before morning.

U. S. District Judge Treat has granted an application in the case of Winslow act. The Cairo and Vincennes Railroad for the appointment of a receiver for the road. The designation of the receiver is withheld for the present, pending the settlement of the Company's proposition to give a bond for the payment of Winslow's claim of $764,000.

THE ACADEMY OF SCIENCE.

SESSION AT WASHINGTON—FIRST DAY.

CLASSIFICATION OF INSECTS—AN AUTOMATON TO PLAY TIT-TAT-TOO—HOW AND WHY WE HEAR—SOUNDS DWELLING IN THE EAR—FLAME PREVENTING SOUND FROM PASSING—THE STRENGTH AND WEAKNESS OF PINE WOOD.

[FROM A SPECIAL CORRESPONDENT OF THE TRIBUNE.]

WASHINGTON, April 21.—The National Academy of Science is obliged by the terms of its charter from Congress to hold a meeting in April of each year at Washington. It usually happens that the accumulation of papers which the members are anxious to put on record is too great to wait for the annual opportunity, and that a meeting is called some time during the Fall to throw off the superfluous load. This was the case last year, and led to the meeting in New-York in October, which was fully reported at that time in THE TRIBUNE. But the Washington meeting is always regarded as the one of greater consequence; and as the National Academy is the highest scientific body in the country, this session must be regarded as of the utmost importance. To it the most eminent men in their special pursuits whom America possesses contribute the fruit of their painstaking researches, not unfrequently embodying in a single paper the labors, not to say the aspirations, of months or even years.

The meeting is held at the Smithsonian Institution, a temple of science which is the fitting repository where from all lands and seas curious and valuable things have been collected, till now it takes high rank among the few great museums of the world. The venerable Prof. Henry, Secretary of the Institution, presides over the deliberations of the Academy. The limited number who by the system of election can be joined to our "immortals" are more largely in attendance than last year at Columbia College. There is a sprinkling of curious visitors, but the Academy makes no bid for popularity. I do not see that any Congressmen or Senators are attracted hither. Prof. Le Conte was called upon for the opening paper, which was a delicate compliment to a rival institution, as he is the President elect of the American Association for the Advancement of Science, a body which has a larger hold on the popular heart than the Academy.

CLASSIFICATION OF THE RHYNCHOPHOROUS COLEOPTERA.

BY JOHN L. LE CONTE, M. D.

Dr. Le Conte's paper opened with an allusion to the fact that at the January meeting of the Academy of Sciences in 1867 he had opened the subject now under consideration. The group of insects referred to are exceedingly complex in their characteristics, and good European entomologists had made frequent efforts to settle their classification. These attempts were reviewed historically, and the methods and systems were detailed of Schonherr in 1833-34 and Prof. Lacordaire in 1863, the latter being somewhat supplementary; of Mr. H. Jekel in 1860; the remarks of Mr. Suffrain in 1847, and of the work of Prof. C. G. Thompson in 1865, and the careful studies of Dr. George H. Horn, 1873. From the last-named work Dr. Le Conte selects a statement concerning the males of some genera having eight and the females seven dorsal abdominal segments, and calls attention to the importance and wide extent of this characteristic. He has made a series of dissections of Rhynchophorous insects, and makes a division of them into three series: (1.) Haplogastra, having abdomen alike in both sexes; ventral segments not prolonged upward into a sharp edge. (2.) Allogastra, abdomen dissimilar in the two sexes; ventral segments prolonged upward, forming a sharp edge. (3.) Heterogastra, abdomen alike in both sexes; ventral segments prolonged upward to fit into the elytral groove. Many other distinctive characteristics were given, with a detailed description of the very numerous genera belonging to each of the series.

AN AUTOMATON TO PLAY TIT-TAT-TOO.

BY PROF. FAIRMAN ROGERS OF PHILADELPHIA.

This paper described combinations of mechanism for imitating mental processes, illustrated by means of diagrams showing the peculiar requirements of an automaton which should play the game of tit-tat-too against an opponent; the play of the automaton to be a resultant effect of the play of his opponent.

Among the various classes into which machines may be divided, we find those which have for their object the mere transformation of motion according to various sequences, as is the case in clocks, certain portions of moving machinery, and especially calculating machines. In all these the apparatus being constructed according to a certain law, goes through operations automatically, which resemble to a greater or less extent the operations of the human mind. In the case of the calculating machine it reproduces and extends in a regular sequence the form with which it starts.

Babbage, in speaking of his analytical engine, has suggested that a machine might be made which would play a game of combination such as draughts, provided the maker of the machine himself could work out perfectly the sequences of the game. He does not appear to have published anything further on this subject, except to suggest that the child's game of tit-tat-too is the simplest of all the games of combination, and therefore possible to be played by an automaton.

The author of this paper finds that the sequences of this game being readily tabulated, it is possible to arrange a machine which will follow them, and which will have the power of apparently selecting the course which will lead to success when there are two ways open to it. It differs from the calculating machine in so far that it not only follows out a regular sequence as the result of its construction, but it is able to follow out the principle of the game when modified by the varying and unexpected moves of its antagonist. The manner in which this is done is briefly as follows: The opponent to the automaton makes the first move in the game, and in so doing causes a certain cylinder or equivalent device to change its position. This, from the construction of the apparatus, causes the automaton to make that play which the proper sequence of the game requires, and at the same time moves the corresponding cylinder into position. The next play of the opponent moves the third cylinder, and the combination of the three cylinders determines the action of the automaton for the fourth; and so on throughout the sequence. If the player plays perfectly, the game will be drawn, as the automaton's play is mathematically correct. If the opponent makes a mistake, the automaton, by a simple device, takes advantage of it, and makes such a play as to win the game. Illustrations were then given on the blackboard, showing that there were three general conditions of the problem, the third being much more complicated than the other two.

The application of this mechanism to a game of this kind is intended to illustrate its character, and to show that its addition to apparatus for registering physical phenomena, or for performing geometrical or mathematical operations, may enable such mechanical devices to have a use much more extended than heretofore.

The paper of Prof. Rogers excited much interest, and the practicable character of the proposed automaton was very clearly demonstrated. Prof. Hilgard inquired how many pieces of machinery were necessary. Mr. Rogers said that in the first of the three cases involved by the problem, there were 18 levers required; in the second case, 32; in the third, 48. As many cylinders were required as there are units in the game; as many levers as there are combinations. To economize machinery, the board itself turned round a half or more.

Prof. Hilgard asked whether we do not really think very much as the automaton acts—whether the mental process was not similar to the mechanical. Prof. Henry said that the question was transcendental in its character. Mr. Rogers mentioned that several solitaire games could be played by an automaton, and that the machinery for this was very simple, but it had not the same interest as a machine which could take advantage of an opponent's mistakes.

Three papers by Prof. A. M. Mayer of the Stevens Institute of Technology, Hoboken, in the absence of their author, were read by the Secretary of the Academy.

FUNCTIONS AND MECHANISM OF AUDITION.

BY PROF. A. M. MAYER.

This paper was entitled Suggestions as to the Functions of the Spiral Scalæ of the Cochlea, leading to an Hypothesis of the Mechanism of Audition. It opened by a reference to the paucity of investigations on the form and functions of the cochlea, and mentioned as the principal if not the only contribution to the subject the statements and suggestions of Dr. J. W. Draper in his work on physiology in 1853. Prof. Mayer dissents, however, from the view taken by Dr. Draper respecting the action of the auditory apparatus, basing his objections on a measurement of the wave-lengths of the assumed vibrations and a comparison of these lengths with the lengths of the spiral scalæ which were believed by Dr. Draper to be the subjects of these vibrations. Prof. Mayer shows that the scalæ are too short to fulfill the requirement.

Prof. Mayer's paper then gives a careful, detailed, technical review of the anatomy of the ear. He then undertakes to show that the significance of these anatomical relations is to bring the sound vibrations to act with the greatest advantage on the co-vibrating parts of the ear, and to cause these parts to make one-half as many vibrations in a given time as the tympanic or basilar membranes. This is demonstrated by an extended review of the functions and possibilities of different portions of the auditory apparatus. In the course of this train of argument Prof. Mayer advances the view that what are known as the hair-cell cords, having swellings in the middle of their lengths which cause them to act like loaded strings, are probably so constituted that each hair-cell cord is adapted to co-vibrate with only one special sound. He mentions, referring to one of his own discoveries reported in THE TRIBUNE last October, that these hair-cell cords are placed in reference to the pulses striking them, somewhat in the relation which the external fibrils of the musketo bear to a wave-surface to which their lengths are perpendicular. If his view be correct, these cords bear to the membrane to which they are attached, the same relation as stretched strings bear to the vibrating tuning-forks in Melde's experiments, and therefore a cord in the ductus of the ear will vibrate only half as often in a second as the basilar membrane to which it is fastened.

Prof. Mayer was able to illustrate this theory by an apparatus devised for the purpose. But perhaps the most convincing experiment in support of the hypothesis was this: a tuning-fork held near the ear causes a sensation corresponding to the designated pitch of the fork. But the vibrations of this fork can be sent to the inner ear through the bones of the head. Now if we first hold the fork near to the ear and note its pitch, and then press it firmly against the temporal bone, we should perceive a marked difference; we should hear the simple sound of the fork accompanied by its octave. By a variety of modifications this effect was clearly brought out, the sound communicated only to the internal ear always having the higher octave of the fork singing along with its usual note. If the external ear be now closed, the higher octave sounds as loud as the original note. Prof. Mayer has the testimony of an accomplished musician to the success of this remarkable experiment.

DURATION OF THE SENSATION OF SOUND.

BY PROF. A. M. MAYER.

This paper was headed Abstract of a Research in the determination of the Law connecting the pitch of a sound with the duration of its residual sensation, and on the determination of the numbers of beats—throughout the range of musical sounds—which produce the most dissonant sensations; with applications of these laws to the fundamental facts of musical harmony, and to various phenomena in the physiology of audition. Prof. Mayer gave the particulars of a series of experiments by which it was ascertained what must be the frequency of successive sounds to have them blend indistinguishably together. Worked out mathematically, the data indicated that the residual sensation only occupied one five-hundredth of a second in the case of 40,000 vibrations per second; but in the case of 40 vibrations to a second the residual vibration was one-eleventh of a second. He concludes that the whole ear vibrates as one mass, and the durations of these oscillations of the whole ear are far too short to remain one-thirtieth of a second. He thinks that this explains our inability to distinguish the actual pitch of sound when that pitch exceeds certain well-known limits.

REFLECTION OF SOUND FROM FLAMES AND HEATED GASES.

BY PROF. A. M. MAYER.

This was a series of experiments showing that flames, heated gases, and cold gases of densities differing from that of the atmosphere can reflect sonorous aerial vibrations, and the experiments have also given a measure of the reflecting power of flat gas flame. Prof. Mayer was incited to this investigation by reading the exceedingly interesting experiments of Prof. Tyndall on the stoppage of sound in a non-homogeneous atmosphere, and the description of an apparatus devised by Mr. Cottrell to illustrate this, and also a paper by that gentleman on "The Division of a Sound Wave by a layer of Flame or heated gas into a reflected and transmitted Wave."

Prof. Mayer's method of illustration is simple and easy of performance. He takes two similar resonators and places the planes of their mouths at right angles to each other. Then in this angle he firmly fixes the tuning-fork corresponding to the resonators, so that the broad face of one of its prongs faces the mouth of one resonator, while the space between the prongs faces the mouth of the other. Complete interference of the sounds issuing from their mouths is obtained, and the only sound that reaches the ear is the faint sound given by the fork's action on the air outside the angle included by the mouths of the resonators. If in these circumstances we close the mouth of either one of the resonators with a piece of cardboard, the open resonator will strongly reënforce the sound of the forks. If we now cover the mouth of this resonator with card-board, we shall again have silence.

Now substitute for card-board, when both resonators are open, the flame of a bat's wing gas-burner, with one resonator, and use something more permeable to sound than the card-board with the other. By trying a series of more and more permeable diaphragms, it was found that tracing paper just equaled the effect of the gas-flame in guarding the mouth of the resonator from the entrance of sound. A sheet of heated air above the gas-burner was found to be exactly equivalent to the gas-flame. The passage of a sheet of cold coal gas over the mouth of the resonator produced a similar effect; and so also did carbonic acid gas, though in less degree; but cold, dry hydrogen closed the mouth of the resonator more effectively than either of the above gases, though not equal in this respect to the heated air above the bat's wing flame. Among other curious results, Prof. Mayer has ascertained that there is an absorption of sound in the bat's wing flame; that the flame is heated by the sonorous vibrations which enter it as such, and issue as heat vibrations. He has endeavored to obtain a quantitative mathematical analysis of this absorption and hopes for exact results.

TESTS OF THE STRENGTH OF PINE.

BY PROF. W. A. NORTON OF YALE COLLEGE.

This paper was exceedingly elaborate, and gave the results of a series of experiments on the sets or residual deflections of pine sticks after having been subjected to a transverse stress. In 1869 Prof. Norton demonstrated that the received theoretical formula for the deflection of rectangular beams under stress required the addition of another term, varying directly as the length and inversely as the breadth and depth of the beam. Since then he has been more recently experimenting upon residual sets or deflections. The apparatus for testing was described at length and with great detail. Great care was taken to guard against incidental errors, especially in respect to consequences of changing temperature during the stress. There was evidence that after repeated strains a molecular change took place in the wood, and the effect of strain, after an interval of rest, to a great extent not only passed away, but even left the stick with less set than it had a short time before. A great number of curious and seemingly contradictory results were obtained in the course of these very numerous and varied experiments. As one of the results obtained it appears that a load equal to one-fourth of the breaking weight produces a permanent set, and that repeated applications of this load from day to day are attended with a continually increasing set. It results that such wood should never be subjected in any structure to one-fourth of its breaking strain.

The proceedings of the day were closed with the reading of a biographical sketch of Prof. Henry James Clarke.

THE SECOND DAY'S PROCEEDINGS.

DR. BROWN-SEQUARD'S THEORY OF THE OPERATION OF THE NERVES AND BRAIN—PROF. NEWCOMB TELLS OF WHAT AMERICA IS DOING FOR THE COMING TRANSIT OF VENUS—MAJOR POWELL'S EXPLORATION OF THE CAÑONS OF COLORADO.

[FROM A SPECIAL CORRESPONDENT OF THE TRIBUNE.]

WASHINGTON, April 22.—To-day's session far exceeded its predecessor in interest. It is rather unfortunate that the Academy makes no announcement in advance of the programme for the day, but this is of a piece with its general indifference to public attention. Not only is no programme published, but scarcely any is arranged in advance. Only a few of its members knew that Dr. Brown-Séquard was to deliver an address; still fewer knew that Prof. Newcomb was to speak, and there was an element of uncertainty even as to Major Powell. Had it been generally known that Dr. Brown-Séquard would tell us something about our brains, there would have been no difficulty in packing the long hall of the Smithsonian with an eager audience. A master of the subject with which few are acquainted, he brings to every utterance upon it the rare results of his own inquiries coupled with a freedom from prejudice in favor of antiquated views that is rare in his profession.

In his address to-day he has given a clearer expression than ever before to his own views of the structure and functions of the brain and nervous system. Hitherto his lectures seem to have been too much confined to tearing down the edifices of theory which his predecessors have so laboriously reared. The present address is not open to that objection, though it does good service in exposing the fallacy of views recently advanced by Dr. Ferrier of England, formed on a narrow circle of experiments, which have threatened to lead us back into the mists of error from which we were gradually emerging.

The address of Prof. Simon Newcomb, the eminent astronomer of the Washington Observatory, has an immediate interest. Very recently *The London Times*, in a very long article describing the preparations making for observations on the transit of Venus, dismissed those of America in a sentence of almost contemptuous brevity, to the effect that little or nothing was known about them. It is a fact that our preparations are of the most thorough character, that they embrace novel and ingenious modes of procedure, that they are worthy both in their scale and character of the nation and of American science, and that they bid fair to accomplish excellent results. It was to tell of this that Prof. Newcomb emerged from the seclusion of his watch-tower in the skies—a man of bashful and retiring manner, plain and thoughtful in his words, and giving his facts with simple directness of expression.

Major Powell's description of the Cañons of Colorado brings freshly before us the wild features of that strange Western country which he has done so much to explore. His expedition seems to have penetrated regions hitherto deemed almost inaccessible, and he has brought back a large amount of information of value from a scientific point of view, as well as an exceedingly entertaining narrative of adventure.

Notwithstanding the fact that so few knew what was in store for them, there was a considerable popular audience present at the session to-day, including a number of ladies.

FUNCTIONS OF THE BRAIN AND NERVES.

BY DR. C. E. BROWN-SEQUARD.

The title of this address on the pretended localization of the mental and the sensorial functions of the brain. Dr. Brown-Séquard began by saying that the subject has been rendered more difficult by assumptions of physiologists upon insufficient data. Among the views which have been recently put forward upon the localization of nervous power in certain parts of the brain, there are two of importance: One relates to the seat of power actuating muscles, and the other is as to the seat of sensation for different nerves. In the latter particular, I shall review especially the assumption in respect to the seat of power for speech. The following are some of the old views respecting the localization in the brain of the various faculties. There was a theory put forward by Müller of Berlin which for a time had great popularity. It was, however, absolutely wrong. It assumed that as regards the power of the action of the will on the muscles, the brain must be considered as the keys of a piano. When the soul or the will acted to produce a movement, it was supposed to act upon the nerves as the fingers upon the keys of a piano. As regards sensation, the mechanism was supposed to be equally simple; it was supposed that there were elements by which the sensations were transmitted through the whole system, without any break, through the spinal cord to the brain.

DEFECTS OF THE MECHANICAL THEORY OF THE NERVES.

This theory assumed that sensation was conveyed through the body by the nerves, as the bells rung in any part of a hotel have the sound conveyed along wires to a central office, where the fact is recognized from where the call may come. But this assumption was just as false as it was simple. There is no such compact continuity. Pathology shows that there is no foundation for such views. In the first place, the spinal cord (which is the organ through which all the nerve fibers or conductors coming through the brain have to pass, and also all the conductors coming from the periphery to the brain have to pass) can be destroyed in great part without destroying either the power of motion or the power of receiving sensations. There are facts respecting the *medulla oblongata*, which as you know is between the brain and the spinal cord, which place this beyond the reach of question, and prevent Müller's theory of mechanism from having our permanent acceptance.

There are other facts relating to this question which are certainly quite clear. There are animals utterly without brain, which still exercise the functions that are supposed to be located in that organ, such for instance as the *Amphioxus lanceolatus*. In others we find the part that answers to the brain is hardly large enough to meet the requirements of such an organ. Now if you hold your arm upon a table and try to make dots with a pencil in your fingers without changing the position of your arm, you will be able to make perhaps 1,000 points. Well, if such a power as that exists—and, indeed, the number which I have given is not too large, as I have counted 792 points made by myself, and I am a miserable draughtsman—if such a power exists with so little movement, you can easily understand what an immense number of fibers it would require to establish communication between the brain and the periphery, were all the fibers continuous from the brain to the periphery, or vice versa. Again, if we divide a portion of the spinal cord we may find a diminution of sensation and voluntary movement, or both, below the point of division; but the communication is not utterly severed; there is not always complete paralysis, as there should be to satisfy the conditions of the piano-wire theory.

In fact there is no necessity of more than a very few fibers to establish communication between the brain and the spinal cord. It is more like a telegraphic communication than a movement along a wire, by which sensation is conveyed from the periphery to the brain, or the brain transmits its orders to the periphery. Let me give an instance of what I mean. If a piece of ice is laid upon my foot, I have at once, the sensation of a contact, sensation of a temperature, the sensation of the extent of the surface of the ice that touches me, the sensation of the weight of the ice, and, if it is left upon my foot, the sensation of pain, and the sensation of the skin to which the ice is applied. All those forms of knowledge are communicated at once. I believe that all these impressions are communicated to the spinal cord, which as a single wire transmits it to the brain.

PERTINACIOUS ADHESION TO EXPLODED THEORIES.

Now, as to the two sides of the brain, the old view was that the left side of the brain governs the movements of the right side of the body, and the right side governs the movements of the left side of the body; and that there is a similar view respecting perception and sensation. Facts oppose this view. I am sorry to say that physicians adhere too pertinaciously to old views like this, without regarding more recent discoveries. We are constantly holding on to our old clothing, wearing it when it is worn out. I am sorry to speak thus severely of a profession which is my own, but the discoveries of the last ten years seem scarcely to be recognized by the medical faculty. Younger members of the profession should seize opportunities to make themselves familiar with the advances of modern discovery. Take such facts as this for instance: One-third of one-half the brain may be utterly destroyed without any symptom of the injury; then one-third of the other half, and still no symptom. Still another third of either half may be destroyed without any indication of ill-health. There are hundreds of the first-named cases; I know of eleven or twelve of the latter. But Abercrombie and Spicer relate still more remarkable cases. A lady of refinement had had very slight symptoms of any trouble with the brain. She had gone to a tea party and enjoyed himself there; had walked about and talked as if in her usual health. Nothing in her sensations indicated any serious trouble. She was found dead in her bed the next morning. The autopsy revealed that one-half of her brain was entirely destroyed, and moreover that this destruction had been of long standing. The account of this is to be found in Abercrombie, page 177, 4th edition.

Let us now consider the question of the locality of the intelligence of the brain. Most physiologists are agreed that this is the gray matter of the upper parts of the brain. But the method of communication is still open to research. Here the lecturer went to the blackboard and drew a figure somewhat like a sheaf of wheat without a band around it; the stalks representing the nerves, the heads of wheat representing the cells. Now you may subtract from this, by disease or otherwise, say the upper third, and still you have the nerves and the nerve cells and the processes can be carried on; but in the progress of such destruction downward there would eventually be reached a point where the functions of the brain could no longer exist. This view would explain the facts as we find them. But there is no case on record where the gray matter on both sides of the brain has been destroyed without the loss of intelligence, and we must regard that gray matter as the seat of the intelligence. But vast portions may be removed before the loss of intelligence becomes apparent. This I have myself tested and proved by vivisection of the lower animals.

There is the case of the paralysis of the insane, where the gray matter may be diseased on both sides of the brain. In these cases the power of speech does not seem to be involved. There are cases of aphasia where the diseased person has had the power of speech restored during delirium. The speech is coherent, though the sense may not be. It is evident then that the faculty of speech is not actually lost in such cases; and yet we find that the third frontal convolution is actually diseased in these aphasiacs who talk in their delirium. But the most decisive argument is found in the cases that I have seen, where the third frontal convolution, the alleged organ of speech, has been destroyed, and yet the patients have not lost the power of speech. Therefore the theory is itself destroyed. There are fifty cases on record to show that the question of right-handedness or left-handedness does not apply in these considerations. The lecturer here cited cases of Jacmet of Montpelier and Mr. Prescott-Hewitt of London. In the latter case the patient had suffered a destruction of that part of the brain for 20 years, and yet for 20 years had spoken.

THE LOCALIZATION OF CENTERS OF MOTION IN THE BRAIN.

We shall now take up the question of the localization of motion in certain parts of the brain. I am surprised at the avidity with which a certain series of facts have been accepted as proof of this theory in England. A very eminent man, of whom I should not like to say anything severe, my friend Prof. Carpenter, has accepted those views. I may say that all England has accepted them. Prof. Huxley indeed has written me that he only accepted this view in part; but I cannot see how he can accept a part without accepting the whole, where even the part is incorrect. The famous experiments of Dr. Ferrier of Guy's Hospital must here be considered. As you will see, they are not, however, conclusive. By the application of galvanism to certain parts of the brain of animals, he produced certain movements. When we do not stop to think, this would seem to prove that there are in the brain certain centers of movement governing certain parts. But it is only a semblance. A part of the facts are taken for the whole. We should know all the series before we adopt the conclusions. Let us examine the other facts.

It is perfectly well known that the cutting away of a large portion of the brain does not produce the least alteration of voluntary movement anywhere. Suppose that part of the brain—say the anterior lobe, being excited by galvanism produces a movement in the anterior limb. Now suppose that part of the brain is cut away—then the anterior limb should be paralyzed, for its voluntary movement is gone. Admitting that the other half of the brain should supply the place of the missing part; let us take that away also. Then certainly there should be a paralysis of the anterior limbs. But there is not. This should be sufficient to invalidate the conclusions of Dr. Ferrier. But there are abundant pathological facts of this nature, proving the fact beyond question. And then there are the cases of recovery from paralysis. There is no such localization of power as Dr. Ferrier has assumed. If galvanism be applied to the severed leg of the frog, the leg will jump, though there is no brain power in the question.

Dr. Brown-Séquard then applied a similar course of reasoning to the localization of sensation in specific parts of the brain, using, among other happy illustrations, this fact: An intestinal worm will occasion sometimes convulsive movements, sometimes paralysis, sometimes deficient sensation; are we therefore to conclude that in these cases the center of power was in the abdomen? He attacked the view of Gall, saying that we do not know the locality of these affections, and have no reason to suppose that they originate in a limited area of the brain. We now know that only a few fibers are necessary to make the connection between the spinal column and the brain. The brain, like the rest of the body, receives nerve fibers coming from other nervous centers, some along the blood-vessels, for there are a great number of fibers starting along the blood vessels and going into the cellular tissue of the brain; some fibers coming from the sympathetic nerve; others coming from various sources. We find, for instance, that the prick of an exceedingly fine needle at the *crux cerebelli* will produce rotary movements, the animal whirling around with a rapidity impossible in a normal condition. The activity of the heart may be stopped by the prick of a needle point; convulsions may be similarly stopped by the action of carbonic acid on the mucous membrane of the throat. With these facts under consideration we may see the vast field of research that yet lies before us, the mere questions arising from the activity of nerve cells affording an almost boundless subject for inquiry. But it is evident that we cannot locate the centers of either sensation or motion in specific parts of the nervous system.

OBSERVING THE TRANSIT OF VENUS.

BY PROF. SIMON NEWCOMB.

This was a description by the astronomer in charge of the Washington Observatory of the proceedings in this country for the great astronomical event of next December. The first steps in respect to the observations on the Transit of Venus were taken in this city four years ago. The plan adopted divided itself into three parts; the nature of the observations; the stations to be chosen, and the organization of the parties of observers. The fundamental idea of the methods adopted was then stated. The two classes of determinations were, on the one hand, observations of interior and exterior contact, and on the other, measurements between the centers of the bodies observed. There are also the visual method and the photographic method.

Hitherto the visual method, however employed, has proved very uncertain. It is now about 200 years since Halley observed a transit of Venus at the Island of St. Helena. The absolute accuracy of his observations cannot now be accepted. The difficulty is in knowing the exact moment of the ingress or egress of the planet from the sun's disk. The approach of the two points of light when the planet cuts the disk of the sun is a matter not only of the most delicate observation, it is a point in which an intrinsic uncertainty is involved. Even at the last transit of Mercury, observers differed enormously in noting the time of disappearance of the dark line of sky which separated that planet from the sun.

DIFFICULTIES IN OBSERVING A TRANSIT.

The best way to ascertain the conditions of this phenomenon is by the observation of the transit of an artificial Venus over an artificial sun. This was done, rather more than a year ago, at the high point visible from the Observatory. The artificial sun and planet were placed on Wilder's building, at a distance of 3,300 feet, in order that full effect might be given to atmospheric vapors and softenings of the outline. The apparent size of the artificial sun and planet were those that will be presented by the real bodies at the time of the transit. It is found that the sun looks a little larger and the planet a little smaller than their true magnitudes. When the light of the sun is close to the planet the space between is apparently filled by a ligament known as the black drop. It is commonly supposed that the moment of disappearance of the black drop is the moment of contact; but the uncertainty thus occasioned is of serious moment. It is not due merely to a bad atmosphere; it is an absolute effect independent of this cause. In observing the artificial Venus the same difficulty is more or less encountered. Even in a fairer atmosphere than we hope for at the time of the transit we must expect this phenomenon.

In moving toward the edge of the sun, before reaching it, there is again a similar source of error. A cloud seems to pass through the thread of light between the planet and the edge of the sun; the bright line grows darker and darker, and at last disappears—that being the moment of true contact. No ordinary observer can fix this time with accuracy. Another method has been suggested—observation by photography; but the difficulty here is that the photograph is dependent upon the comparative actinic power of the thread of light, and every photographer knows that the slightest haze will make a difference in the impression on the sensitive plate. The light thrown on one plate may be five or even ten times greater than on another without any corresponding difference in the facts. I think we shall not attempt the photographing of the interior contact.

It was supposed that the movement of Venus into the sun's atmosphere could be observed by means of the spectroscope with great accuracy; but a committee in Germany, including Zowlner and Awers, came to the conclusion that this was after all one of the most uncertain methods, and it was finally given up entirely. It has been found, however, that the moment when the planet first makes a notch on the sun is a well defined occasion, and the experiments of Strübner of St. Petersburg agree with ours on the artificial Venus in this particular. Another method of determining this problem consists in observing the distances of the centers of the two bodies. The Germans thought of doing this by means of heliometers; but the use of the necessary number of these instruments is impracticable, as they are cumbrous and expensive. I believe there is not a heliometer in this country.

STATIONS AND ORGANIZATION.

Let us now consider the matter of stations. Suppose for instance that we had four stations, two northern and two southern. If these were divided into two classes of observations, A and B at the north and A and B at the south, as A is not comparable with B, the failure of either A at the north and B at the south, or B at the north and A at the south, would render all the four observations valueless. Therefore, all the observations will be of the same character. The chief element in selecting stations has been their meteorology, the question at issue being their liability to bad weather at the time of the transit. About two years ago circulars were sent to American Consuls in almost every part of the world where the transit is visible, to ascertain the condition of the weather at those points in November and December, and every other source of similar information was utilized. We had thought of selecting from a number of others Hurd's Islands in the Southern Indian Ocean as being one among the best stations. Northern stations with probabilities of good weather are easily to be had. Especially favorable in this view is Peking in China and Vladivostok in Siberia. In Japan the weather is scarcely as favorable. Hakodadi was very objectionable in respect to weather; Yokohama was just as bad; Nagasaki was rather better.

The only satisfactory station in the southern hemisphere in respect to weather was found to be Hobart Town, in Tasmania. New-Zealand is nearly as favorable. But from all the other proposed Southern stations the accounts were very bad; notably at the proposed station at Hurd's Islands the almost uniform report was "clouds, rain, tempests, and snow;" the chances of observation there did not exceed two-tenths; this station was therefore given up. The most favorable station left at the South was Kerguelen Island, though somewhat neighboring to Hurd's Islands, and that was selected. A party will also be landed, if practicable, at Croisette. Instead of sending four parties to each hemisphere, we shall send three to the north and five to the south, to equalize the chances as to weather. I hope to get complete results from two parties in each hemisphere.

To each party there are detailed two officers from the Observatory, two from the Coast Survey, one from the army, one from the navy, and two civilians. Profs. Hall and Harkness go to Hobart Town. Among the civilians are the celebrated astronomers, Profs. Watson of Ann Arbor and Peters of Clinton, N. Y. The constitution of each party is such that in case of disability on the part of its chief, the second officer can take his place. Each party will have three photographers—a chief photographer, who must have been of long experience in the business; an assistant that has had practice, and a second assistant trained only for the occasion. Nearly all the second assistants' positions have been filled by students or graduates of various schools and technological colleges throughout the country. The parties for the southern station will sail, we expect, about June 1. These are all ready; the photographers are to be in full practice here next week. The northern parties will go later and not all together. The Navy Department has furnished a ship, the Swatara, to go to the southern stations. The longitudes of the stations will be determined by occultations wherever telegraph communication is impracticable; but already there is such communication between Vladivostok and Hobart Town. Arrangements are made with the Governments for exchanging longitude signals, and the prospect of the extension of cables to New-Zealand and other points gives fair hope that there will be only a few points where the method of occultations will be the sole resort.

THE COLORADO CANONS.

AN INTERESTING DESCRIPTION OF THE FORMATION OF THE COUNTRY—A REGION OF CANONS AND GORGES.

Major J. W. Powell read a paper giving an account of the progress made in the survey of the Colorado and its tributaries by parties under direction of the Smithsonian Institution. The following extracts show the character of the country:

The whole region embraced in the survey is a cañon country. At the very beginning we have a series of cañons through the Uintah Mountains, as the channel of Green River, Flaming Gorge, Kingfisher Cañon, Red Cañon, the Cañon of Lodore, Whirlpool Cañon, and Split Mountain Cañons. Then Yampa Cañon, the cañon along the lower course of the river of the same name, and many other tributary cañons. Then below, in descending the river, the Cañon of Desolation, Gray Cañon, Labyrinth Cañon, and Stillwater Cañon, with their laterals; then Cataract Cañon, a profound chasm below the junction of the Grand and Green, then Narrow Cañon, which terminates at the mouth of the Dirty Devil River; many cañons lateral in all these have also been explored.

Then Glen Cañon, a beautiful chasm carved by the river, in the bright-red homogeneous sandstone of Triassic age. From the mouth of the Paria River to the mouth of the Colorado Chiquito is the beautiful gorge to which we have given the name of Marble Cañon. The walls are of limestone, and near the foot are of a crystalline structure which receives a beautiful polish; white, gray, slate-color, pink, brown, and saffron-colored marbles are here found, carved and fretted by the waves of the river, and polished by the floods of sand which are poured over the walls during the seasons of showers, giving to the walls of the cañons, which have assumed architectural forms on a giant scale, an appearance of great beauty and grandeur.

Then we have the Grand Cañon, the most profound chasm known on the globe. Were a hundred mountains, each as large as Mount Washington, plucked up by the roots to the level of the sea and tumbled into the gorge, they would not fill it.

Perhaps the most wonderful of the topographic features of this country are the lines of cliffs, escarpments of rock separating upper from lower regions by bold, often vertical and impassable barriers, hundred or thousands of feet high and scores or hundreds of miles in length. I will enumerate some of the more important. First, we have the Brown cliffs, an escarpment which forms the southern boundary of the plateau through which the Cañon of Desolation is carved; then the Azure cliffs, the southern escarpment of the plateau through which Gray Cañon is cut; then the Orange cliffs, a broken escarpment, which commences at the foot of the Sierra La Sal, on the eastern side of Grand River, past the Grand, then across the Green River, and then down in a southwesterly direction parallel to the Colorado River about fifty miles, and then turns again to the south-east and crosses the Colorado, terminating in the slope of the Sierra La Sal, two or three scores of miles south of the initial point. Thus the head of the Colorado, the junction of the Grand and Green, is encompassed by a towering wall—the Sierra La Sal—on the east; on the north, west, and south the Orange Cliffs; on every side a facade of storm-carved rocks is presented. The Indian name for this basin is *Tum-pin wu-near tu-weap*, the land of standing rocks. Buttes, towers, pinnacles, thousands and tens of thousands strange forms of rock, naked rock of many different colors are here seen; so that before we had learned the Indian name we thought of calling it the Stone Forest or Painted Stone Forest; and these rocks are not fragments or piles of irregular masses, but standing forms, carved by the rain drops from the solid massive beds. Weird, strange and grand is the Tum-pin wu-near tu-weap.